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$$\begin{aligned}
\therefore S_m = & \frac{P^{m+1}}{m+1} [1-(1/a)][1-(1/b)][1-(1/c)] \dots \\
& + B_1 \frac{m}{2!} P^{m-1} (1-a)(1-b)(1-c) \dots \\
& - B_3 \frac{m(m-1)(m-2)}{4!} P^{m-3} (1-a^3)(1-b^3)(1-c^3) \dots \\
& + B_5 \frac{m(m-1)(m-2)(m-3)(m-4)}{6!} P^{m-5} (1-a^5)(1-b^5)(1-c^5) \dots \\
& - \dots + \dots - \dots
\end{aligned}$$

When $m=1$, $S_1 = \frac{1}{2} P^2 [1-(1/a)][1-(1/b)][1-(1/c)] \dots$

When $m=2$, $S_2 = \frac{1}{3} P^3 [1-(1/a)][1-(1/b)][1-(1/c)] \dots + \frac{1}{3} P(1-a)(1-b)(1-c) \dots$

When $m=3$, $S_3 = \frac{1}{4} P^4 [1-(1/a)][1-(1/b)][1-(1/c)] \dots + \frac{1}{4} P^2 (1-a)(1-b)(1-c) \dots$

When $m=4$, $S_4 = \frac{1}{5} P^5 [1-(1/a)][1-(1/b)][1-(1/c)] \dots + \frac{1}{5} P^3 (1-a)(1-b)(1-c) \dots$
 $- \frac{1}{8} P(1-a^3)(1-b^3)(1-c^3) \dots$

When $m=5$, $S_5 = \frac{1}{6} P^6 [1-(1/a)][1-(1/b)][1-(1/c)] \dots + \frac{5}{12} P^4 (1-a)(1-b)(1-c) \dots$
 $- \frac{1}{12} P^2 (1-a^3)(1-b^3)(1-c^3) \dots$

When $m=6$, $S_6 = \frac{1}{7} P^7 [1-(1/a)][1-(1/b)][1-(1/c)] \dots + \frac{1}{2} P^3 (1-a)(1-b)(1-c) \dots$
 $- \frac{1}{4} P^3 (1-a^3)(1-b^3)(1-c^3) \dots - \frac{1}{24} P(1-a^5)(1-b^5)(1-c^5) \dots$

PROBLEMS FOR SOLUTION.

ALGEBRA.

83. Proposed by J. MARCUS BOORMAN, Consultative Mechanician, Counselor at Law, Inventor, Etc., Woodmere, Long Island, N. Y.

Solve $x^2 + y = 8 \dots (1)$; $y^2 + x = 69 \dots (2)$, true to four decimals.

84. Proposed by BENJ. F. YANNEY, A. M., Professor of Mathematics in Mount Union College, Alliance, O.

On the present electoral basis, if all the electoral votes of each State are cast solid for one or the other of two presidential candidates, how many combinations of States are possible for a total of 273 votes for the winning candidate?

** Solutions of these problems should be sent to J. M. Colaw, not later than May 10.

GEOMETRY.

91. Proposed by LEONARD E. DICKSON, Ph. D., Instructor in Mathematics in the University of California, Berkeley, Cal.

If a point A remain fixed while a point B moves along a given straight line, prove that the locus of the vertex C of the triangle ABC , similar to a given triangle and lying always on the same side of AB , is a straight line. Verify geometrically for the case in which the angles at A and C remain equal.

92. Proposed by JOSIAH H. DRUMMOND, LL. D., Counselor at Law, Portland, Maine.

Let $ABCD$ be a quadrilateral inscribed in a circle. Draw the diagonals AC and BD . Show that $AB \cdot BC : DC \cdot AD = BD : AC$. [From a note in *Young's Geometry*, edition of 1830.]

93. Proposed by G. B. M. ZERE, A. M., Ph. D., President and Professor of Mathematics in Russell College, Lebanon, Va.

While surveying in a level field I notice a mountain behind a hill. Wishing to know the height of each I take the angles of elevation of the tops of both and find them to be $\beta=45^\circ$, $\delta=40^\circ$. I then measure a straight line $a=400$ feet and find the angles of elevation of the tops to be $\gamma=42^\circ$, $\mu=38^\circ$. After measuring $b=300$ feet more in the same straight line I find the elevations to be $\lambda=40^\circ$, $\nu=36^\circ$. Find the height of each.

*** Solutions of these problems should be sent to B. F. Finkel, not later than May 10.

CALCULUS.

73. Proposed by MOSES COBB STEVENS, A. M., Professor of Mathematics, Purdue University, Lafayette, Ind.

$$\text{Solve } \int_0^{\frac{1}{2}\pi} \log(1 - \tan x) dx$$

74. Proposed by EDWARD R. ROBBINS, A. B., Mathematical Master in the Lawrenceville School, Lawrenceville, N. J.

A circular ring, whose radii are a and b , is cut by a plane making the area of the section (or sections) a maximum. Required the position of the plane, and the nature and area of the section (or sections).

*** Solutions of these problems should be sent to J. M. Colaw, not later than May 10.

DIOPHANTINE ANALYSIS.

64. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Find two cubic proper fractions whose product is a square proper fraction. Can a general solution be made?

65. Proposed by F. P. MATZ, D. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

Find (1) four consecutive numbers whose sum is a square, and (2) four consecutive numbers the sum of whose squares is a square.

*** Solutions of these problems should be sent to J. M. Colaw, not later than May 10.

MISCELLANEOUS.

60. Proposed by G. B. M. ZERE, A. M., Ph. D., President and Professor of Mathematics, The Russell College, Lebanon, Va.

A tube of uniform cross section, small compared with its length, is bent into the form of a cycloid, its open ends lying at the cusps, and this cycloid is placed with its axis vertical and its vertex downwards. Equal quantities of fluids of specific gravity σ , and σ_2 are